

SITE AT 27 DALE STREET, MANCHESTER



FLOOD RISK ASSESSMENT REPORT

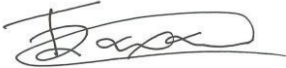
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Document Verification

Prepared For	Barnfield Construction Ltd, Lomeshaye Industrial Estate, Nelson, Lancashire, BB9 5SP
Prepared By	Westlakes Environmental, 20 Dale Street, Manchester, M1 1EZ
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Document History

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1059-008-001	05/12/2022	EZ	GE	CP	First Issue



Executive Summary

Site Setting	The site comprises circa 0.3 hectares of brownfield land. It is located off Dale Street and Little Lever Street in Manchester city centre, at National Grid reference 384565, 398381.
Flood Risk	The EA fluvial and tidal flood map shows that the site and its surroundings is wholly contained within an area designated as Flood Zone 1.
Consultations	As part of consultation process, we have approached United Utilities (UU).
SUDS, Surface Water Management & Preliminary Drainage Strategy	Surface water flows generated by the development's hard surfaces will be attenuated into the wider system. According to the SUDS hierarchy consideration has been given to sustainable methods such as infiltration/soakaways. Based on available information infiltration is not expected to be viable. The runoff generated by the development will be attenuated within the site Residual flows are proposed to be discharged into the public sewer network operated by United Utilities
Controlled Water Pollution	The underlying ground/groundwater beneath the site should be protected from pollution. This will be aided by carrying out the recommendations within this report and by using best practice construction techniques.



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1. Introduction

Westlakes Environmental, as a part of Westlakes Engineering Limited, have been appointed by Barnfield Construction Ltd to provide to prepare a Flood Risk Assessment (FRA) for a 0.3 hectare brownfield site, located at 27 Dale Street, Manchester.

This report presents the findings of the FRA, which has been carried out in accordance with the National Planning Policy Framework (NPPF), Technical Guidance to the NPPF and Planning Practice Guidance. Other documents consulted have included Environment Agency (EA) FRA Guidance Note 1, the local Strategic Flood Risk Assessments Level 1 and 2 (SFRA) and Greater Manchester Surface Water Management Plan Stage 1 – A Strategic Assessment of Surface Water Flood Risk. A full list of documents used to inform this report is shown in the reference section.

This FRA aims to identify and assess the risks of all forms of flooding to and from the site and demonstrate how these flood risks will be managed, taking climate change into account. The FRA also considers the management of surface water runoff and outlines the proposed drainage strategy.

The proposed development should not increase the risk of flooding elsewhere and this FRA has therefore been prepared to demonstrate that this has been achieved. Consideration has also been given to BREEAM accreditation, including the requirements of Pol 03, the risk of pollution to controlled waters and the site conditions prior to, during and after development.

This report is based on information obtained from the site topographical survey and drainage record plans. It has also been informed by correspondence the local public water utility company (United Utilities).

2. Site Setting

2.1. Site Description

The site forms a roughly rectangular parcel of land approximately 14m by 22m in plan with an area of approximately 0.03 ha (300 m²). The site is located at the junction of Dale Street and Little Lever Street in Manchester city centre, at National Grid reference 384565, 398381.

The site was cleared following a serious fire in 2010. The site is currently used as a private car park and is surfaced with crushed demolition rubble. It is understood that the site is underlain by the original basement, now infilled. Part of the original building forms the western site boundary; this is derelict and supported by scaffolding. Palisade fencing forms the northern, eastern, and southern boundary.

2.2. Proposed Future Use

The site is intended to be developed for multi-storey office use and retail.

The proposed development is 6 storeys (ground plus five floors) with a basement and a plant deck on the roof.

The proposed site layout is shown on the Architect's Proposed Layout in Appendix A.

2.3. Site Levels

From the topographical survey, it can be seen that the site is generally flat and level, at an elevation of approximately 47m AOD. The topographical survey is shown in Appendix B.

2.4. Underlying Ground

A phase 2 Ground Investigation has previously been completed by Westlakes Environmental to gain an understanding of the expected site and ground conditions.

Made Ground was encountered at all exploratory locations and was generally found to comprise a black-brown sandy gravelly clay, with a high content of fine to coarse angular gravel and cobbles of brick and concrete, whole bricks and occasional ash, glass, plastic, metal and wood fragments.

Firm becoming stiff Glacial Till was encountered beneath the Made Ground, to depths of 13.8m bgl in BH1 and 15.3m bgl in BH3. Fluvio-glacial deposits were at 14.1m to 18.5m bgl. These were found to comprise very dense grey-brown fine to coarse sands and fine to coarse subrounded gravels of mixed lithologies.

Groundwater has been measured in the Glacial Clay in one of the boreholes at a depth of 4.87m bgl in BH1, and in another at 21.03m bgl in BH2.

The Exploration Hole Location Plan can be found in Appendix C. and for further details refer to Westlakes report reference 1059-002-001 Phase 2 Ground Investigation.

2.5. Hydrology

The nearest surface water course is the Rochdale Canal, located approximately 300m to the south-east of the site. This is classified by the Environment Agency as being of very good chemical quality.

3. Flood Risk

The vulnerability of the site to flooding from rivers, sea and other sources has been considered, along with the potential to increase flooding elsewhere through the addition of impermeable areas and the effect on surface water run-off. Typical sources of flooding include fluvial, tidal, surface water, groundwater, sewers, and anthropogenic sources; these are considered below. The local SFRA has also been consulted.

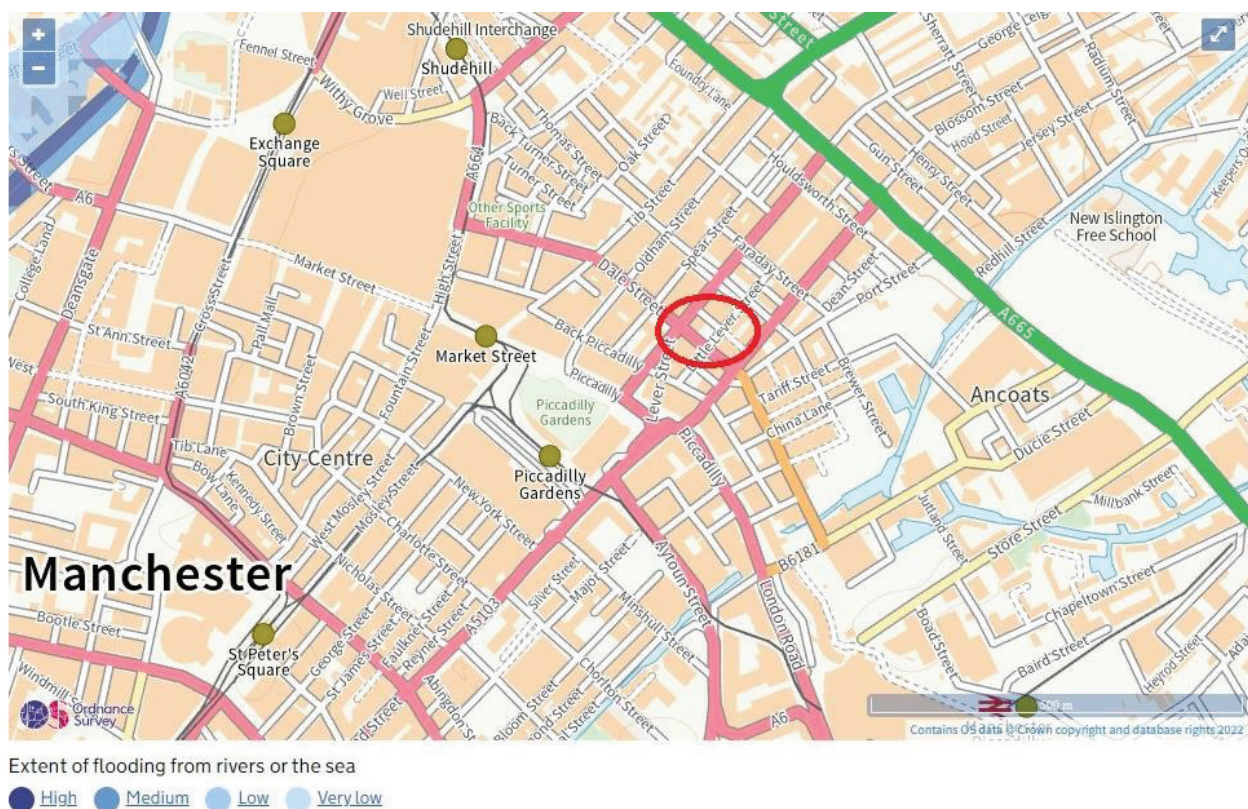
3.1. Flood Zones

3.1.1. Fluvial/Tidal

Flood maps are produced by the EA for the whole of the UK to highlight areas at particular risk of flooding by categorising them into different Zones according to the likelihood of flooding. These maps are based on a broad assessment of areas using digital mapping techniques and extracts from the EA flood maps for the site and its surroundings are included in the figures below.

The EA fluvial and tidal flood map in figure 1, below, shows that the site and its surroundings is wholly contained within an area designated by the EA as Flood Zone 1 (unshaded areas).

Figure 1 – Rivers and Sea



Zone 1 areas are defined in NPPF Table 1 as “land assessed as having a less than 1 in 1000 annual probability of river or sea flooding (<0.1%)”. The compatibility of different end uses with the various Flood Zones is shown in NPPF Table 3 (see Figure 2 below).

Figure 2 – NPPF Table 3

Table 3: Flood risk vulnerability and flood zone ‘compatibility’

Flood risk vulnerability classification (see table 2)		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood zone (see table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	✗	Exception Test required	✓
	Zone 3b functional floodplain	Exception Test required	✓	✗	✗	✗

Key: ✓ Development is appropriate.
 ✗ Development should not be permitted.

Notes to table 3:

This table does not show:

- the application of the Sequential Test which guides development to Flood Zone 1 first, then Zone 2, and then Zone 3;
- flood risk assessment requirements; or
- the policy aims for each flood zone.

The site is proposed to be used as an office accommodation at the basement and the upper 5 floors and retail at the ground floor. All uses are deemed appropriate in Flood Zone 1.

The NPPF also includes a Sequential Test, the aim of which is to locate areas of development in areas at lowest risk from flooding. However, as the entirety of the site is located within Flood Zone 1 it is already located within an area at lowest risk of flooding from tidal and fluvial sources.

3.1.2. Surface Water

The EA’s surface water flood map shown in Figure 3 rates the surface water flooding risk at the site as very low.

A vary minor instance of flooding is reported to the south-east of the development site along Dale Street which, however, is still noted as Low with an estimated maximum flood depth of less than 300mm.

Surface water flood risks usually result from pooling of surface waters and overland flow during heavy rainfall that is not able to drain away.

Figure 3 – Environment Agency Flood Map – Surface Water – Zone 1



Surface water flood risk: water depth in a low risk scenario
Flood depth (millimetres)

Over 900mm 300 to 900mm Below 300mm Location you selected

Management of surface water is being considered as part of the development proposals and a preliminary drainage strategy is outlined within Section 5 of this FRA report.

3.1.3. Groundwater

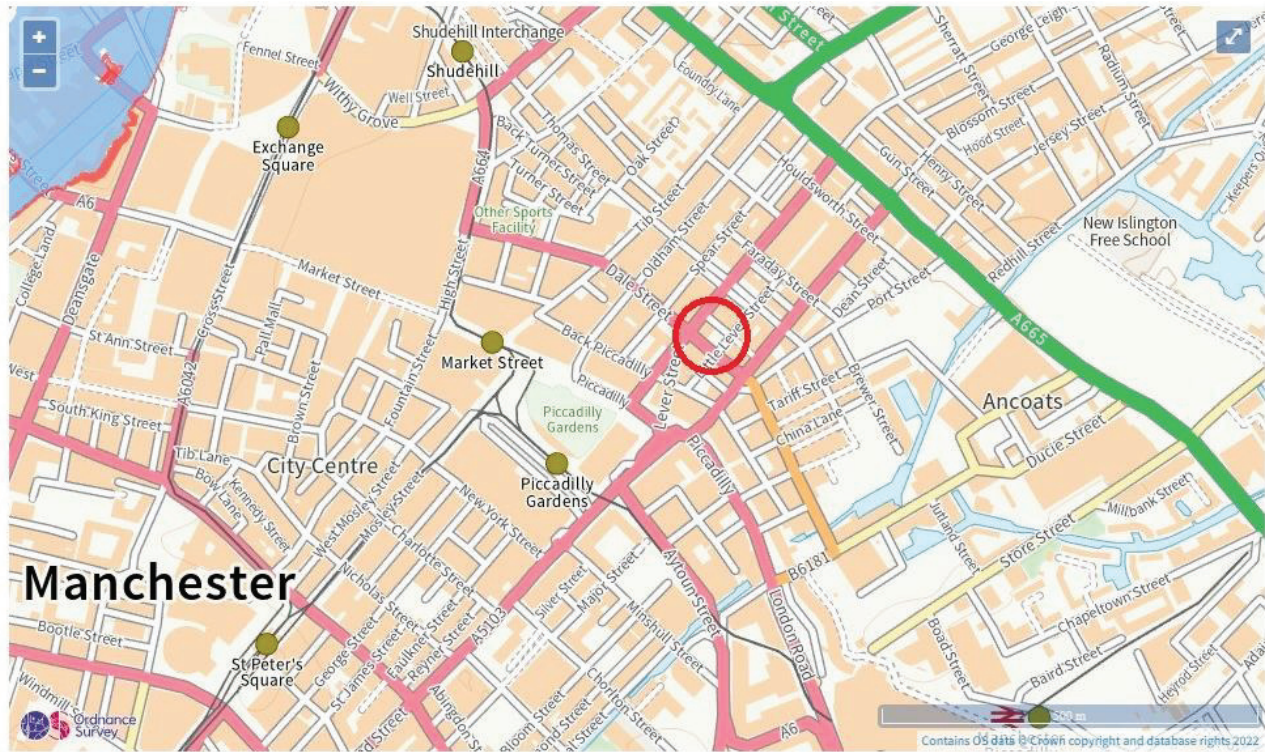
The Level 1 Strategic Flood Risk Assessment commissioned by Manchester City Council states that:

“Groundwater flooding is caused by the natural emergence at the ground surface, of water originating from underlying permeable sediments or rocks (aquifers). The groundwater may emerge as one or more point discharges (springs) or as diffuse discharge/seepage over an extended area. Groundwater flooding tends to be more persistent than other sources of flooding, typically lasting for weeks or months rather than for hours or days.

Groundwater flooding does not generally pose a significant risk to life due to the slow rate at which the water level rises; however, it can cause significant damage to property, especially in urban areas.”

An extract of the Map can be seen in Figure 4 and the complete map at Appendix D.

Figure 5 – Environmental Agency Flood Map – Flood Risk from Reservoirs



3.2. Correspondence

As part of the FRA process the local public water utility company (United Utilities) were contacted to ascertain if they held flood risk information regarding the site, for example records relating to historic flooding or other relevant flooding information. A summary of each response is given below.

3.2.1. United Utilities

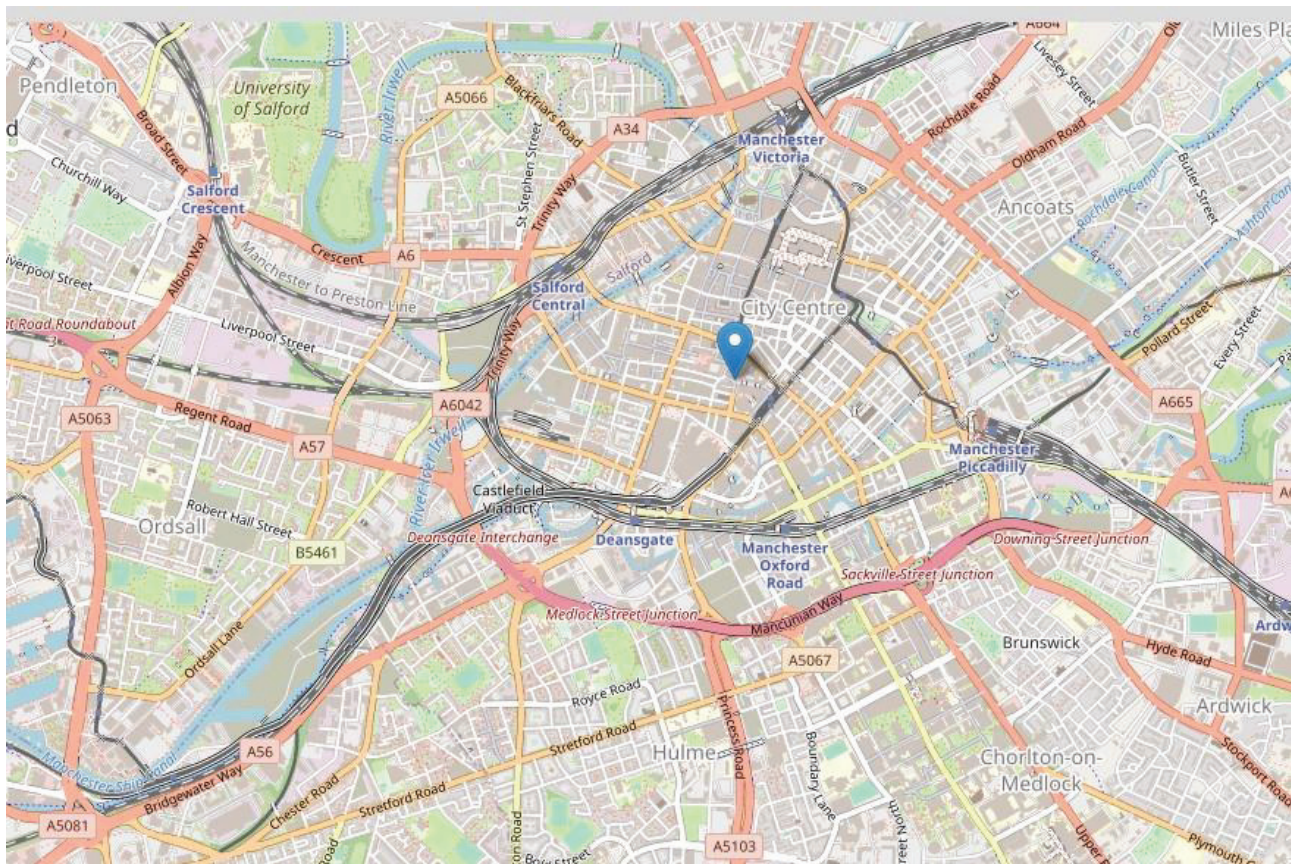
A predevelopment enquiry was issued to United Utilities and their detailed response is included within Appendix E. United Utilities confirmed that there are no known capacity issues in the area and that according to their records there are no nearby historical flooding events relating to sewer flooding.

United Utilities also stated that for the site of 0.3 hectares, the flows should be restricted to 6.5l/s at the 1 in 100-year (+20%CC) storm period.

3.2.2. Internal Drainage Board

The Association of Drainage Authorities (ADA) confirmed that an internal drainage board does not operate within the study area, as can be seen by the absence of shaded areas in Figure 6. This implies that natural water levels within the area are not thought to have been artificially altered.

Figure 6 – Internal Drainage Board Interactive Map



4. Surface Water

In accordance with the NPPF and SFRA, consideration should be given to natural water flows at the site. The development should not adversely affect flow or increase flood risk elsewhere, including increasing run-off rates. The disposal of surface water should be dealt with in a sustainable way and climate change should also be accounted for. The site drainage strategy is discussed in Section 5.

4.1. Previous Situation and Development Proposals

The site was cleared following a serious fire in 2010. The site was used as a private car park and is surfaced with crushed demolition rubble. It is understood that the site is underlain by the original basement, now infilled. Part of the original building forms the western site boundary; this is derelict and supported by scaffolding. Palisade fencing forms the northern, eastern, and southern boundary.

4.2. Climate Change

There is evidence to suggest that the climate is changing with sea levels predicted to continue to rise along with more frequent short-duration, high-intensity rainfall and more frequent periods of long-duration rainfall. The NPPF recommends that the effects of climate change be accounted for in FRA, with consideration of the EA flood maps and local authority SFRA. A 20% increase is therefore allowed for within the new surface water drainage design to take account of climate change. Climate change may also lead to variations in groundwater level. This will also be considered in the drainage design.

4.3. Sustainable Drainage Systems (SUDS)

SUDS are a desirable way to manage surface water disposal within new developments and SUDS methods for surface water drainage management are discussed further within the SUDS Manual.

In following the standard hierarchy of drainage solutions, consideration should firstly be given to the discharge of surface water runoff by sustainable methods such as infiltration. Soakaways are not considered to be suitable at this site because:

- the site is located at a city centre with adjacent structures.
- there is insufficient space within the development to form a soakaway of the required size whilst maintaining the necessary 5m offset from the building foundations and site boundaries.
- the site sits on approximately 10m to 15m of relatively impermeable Glacial Till.
- the underlying Chester Formation is classified as a Principal aquifer.

5. Drainage Strategy

5.1. Existing Drainage Arrangements

A predevelopment enquiry has been submitted to United Utilities. A 450mm diameter combined sewer is located within Dale Street to the south of the proposed site, a 300mm diameter combined sewer has been identified to the east of the site falling south along Little Lever Street before connecting with the 450mm sewer at chamber reference 5302.

To the north of the proposed site a 225mm diameter is present within Bunsen Street which is understood to flow in an easterly direction before turning north at the junction of Little Level Street towards Stevenson square, the 225mm diameter sewer then connects to an adopted 1500mm sewer at chamber reference 6404.

The response from United Utilities states the following:

“Foul water can be discharged to the public combined water sewerage network at an unrestricted rate and can be connected at a point convenient to yourself.”

“Surface water from this site must drain to soakaway or some other form of infiltration system but if ground conditions confirm that this is not a viable solution then the surface water can be discharged to the existing public combined water sewerage network with a maximum pass forward flow rate of 6.5l/s.”

5.2. Surface Water Drainage Strategy

In following the standard hierarchy of drainage solutions, consideration should firstly be given to the discharge of surface water runoff by sustainable methods such as infiltration. The conclusions drawn from Phase 2 Ground Investigation together with site specific information is that the use of infiltration will not be effective for this site as mentioned at section 4.3 and an alternative method of discharge will need to be established.

The current site is understood to be 100% impermeable with the flows from the previous structure discharging via an existing connection to the United Utilities adopted network.

Due to the previous site use, it is considered that the only viable and sustainable solution to provide discharge from the proposed development is to establish and maintain the existing site connection to the United Utilities adopted network.

In order to define the existing flows originating from the current car park, a 2-pipe network has been formed following the guidance contained within Microdrainage modelling software to represent the pre-development impermeable area and simulating the 1 in 100-year storm 360minute duration with results shown below in figure 7.

Figure 7 – Brownfield Run Off Calculation – 2 Pipe Method

Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria								
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000					
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000					
Hot Start Level (mm)	0	Inlet Coefficient	0.800					
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000					
Foul Sewage per hectare (l/s)	0.000							
Number of Input Hydrographs	0	Number of Storage Structures	0					
Number of Online Controls	0	Number of Time/Area Diagrams	0					
Number of Offline Controls	0	Number of Real Time Controls	0					
Synthetic Rainfall Details								
Rainfall Model	FSR	Ratio R	0.358					
Region	England and Wales	Cv (Summer)	0.750					
M5-60 (mm)	18.000	Cv (Winter)	0.840					
Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF					
Analysis Timestep	Fine	Inertia Status	OFF					
DTS Status	ON							
Profile(s)	Winter							
Duration(s) (mins)	360							
Return Period(s) (years)	100							
Climate Change (%)	0							
PN	Storm	Return Climate Period	First X First Y First Z O/F Lvl					
		Change	Surcharge Flood Overflow Act. Exc.					
1.000	360 Winter	100	0%					
1.001	360 Winter	100	0%					
PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	MH1	45.824	-0.116	0.000	0.11	0.0	1.8	OK
1.001	MH2	45.749	-0.116	0.000	0.11	0.0	1.7	OK

Although, the Brownfield runoff rate for the critical storm has been calculated to be 1.7 l/s, the response from UU states that the combined network can receive a surface discharge runoff rate of 6.5l/s.

Therefore, the maximum permissible discharge rate for the surface water used to inform the calculations was 6.5l/s.

Surface water run off calculations have been undertaken using the "Microdrainage simulation" programme, based on the proposed site layout (Appendix F). The storm water arising during a 1 in 100yr event plus 20% allowance for climate change was attenuated within the site by double 450mm pipe before discharging at a restricted rate using a hydrobrake to the existing combined water network beneath Bunsen Street.

The outcome of using a hydrobrake to restrict flow to 5.0l/s was that the peak flow during 1 in 100yr event plus 20% climate change was 5.4l/s, below the 6.5l/s permissible discharge rate from UU.

Microdrainage results are included in Appendix G.



5.3. Foul Flows

In order to allow the basement to perform as a functional space, it has been understood that a foul connection may be necessary, in order to achieve the proposed connection a package pump station will be essential.

There are several combined sewer networks around the proposed site as shown on United Utilities records shown in Appendix E.

The peak flow rate has been calculated using the discharge unit method. The peak foul discharge for the proposed development is estimated as 2.5l/s based on the number of floors proposed in the current development.

The proposed foul water drainage flows generated by the proposed development will be collected by a dedicated foul water network before discharging to the united utilities combined network.

5.4. Access and Egress

The site is accessed directly from Dale Street, which in the vicinity of the proposed application site is contained in EA Flood Zone 1 and are therefore at low risk from fluvial flooding. There are currently small areas of surface water flooding further along the network which may experience localised flooding during heavy rainfall events. Provided surface water drainage is managed appropriately during the development then this should not impede vehicular or pedestrian access. Safe access and egress should therefore be maintained.

6. Minimising the Risk to Controlled Water Pollution

Consideration has also been given to the risk of watercourse pollution as a result of the proposed development. Guidance in 'The SUDS Manual' has also been taken into account.

The potential to minimise watercourse and aquifer pollution during the life of the development is discussed below. Consideration has been given to controlled water pollution pre, post and during construction.

6.1. Pre-Development Situation

The site comprises circa 0.3 hectares (300m²) of brownfield land as discussed in paragraph 2.1, it is understood that the current site is positively drained by a network of pipes which ultimately communicates with the United Utilities adopted networks withing the immediate vicinity.

From the Phase 2 Ground Investigation (reference 1059_002_001) and the current use of the site, it is considered that the existing site in its current condition poses a very low risk to controlled waters.

6.2. During Construction

Site development would entail general construction works to construct buildings and associated infrastructure.

During site works, earthworks and transportation, efforts should be made to minimise dust generation, keeping vehicle movement to a minimum.

Disposal of waste/spoil should be undertaken in an appropriate manner in accordance with the reduce-reuse-recycle waste management philosophy. Any surplus materials should be taken to an appropriate licensed waste disposal facility by a registered waste carrier. There will be excavation for foundations, and the contractors will need to be vigilant and inspect the arisings for contaminants.

Safe and appropriate working practices should be adopted during construction, which will help to minimise the potential for 'pollution' of controlled waters.

6.3. Post-Development Situation

It is proposed to dispose of surface water from impermeable areas into the surrounding sewers at an attenuated rate.

Precautions should be taken to manage future use of water and control run-off.

Drainage systems should be regularly maintained to ensure that they remain fit for purpose. Consideration should be given to the Operation & Maintenance of all proposed surface water features.

Future on-site activities are considered to represent a very low level of risk to controlled waters, as the site will be used as an office development.

The EA provides Pollution Prevention Guidance notes, where further guidance can be obtained if required.

6.4. Summary

The underlying ground/groundwater beneath the site should be protected from pollution. This will be aided by carrying out the recommendations within this report and by using best practice construction techniques.

A development of office building is proposed, which poses minimise potential contamination risks.

Overall, the influence of the development on controlled waters has been considered. Potential historic risks to controlled waters appear to be very low. Residual risks from development are thought to be low provided that best practice procedures are followed.

7. Conclusions

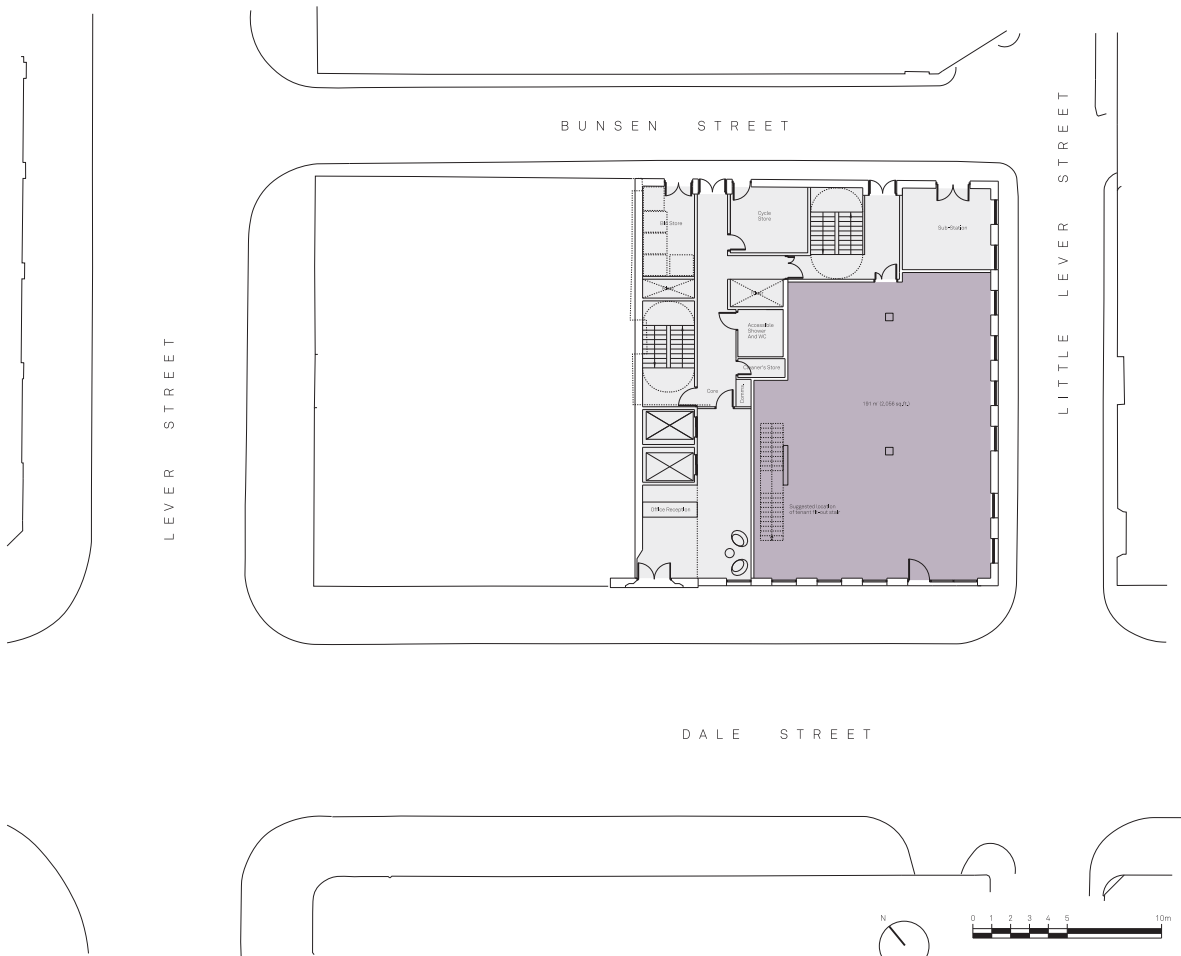
1. The site is wholly contained within in EA Flood Zone 1. Reference to NPPF Table 3 shows that an Exception Test is not required as office end-use is deemed appropriate in Zone 1.
2. The site is considered to be at low overall risk of flooding. EA mapping indicates that surface water flooding does occur in the vicinity of the proposed site and this potential risk has been considered as part of the preliminary site surface water drainage strategy.
3. The risk of flooding elsewhere should not be increased as a result of the development.
4. The nearest surface water feature is located approximately 300m to the south-east.
5. A maximum permissible discharge rate of 6.5 l/s for the 1 in 100-year storm event was used as the basis of the proposed design.
6. Attenuation was provided on the site to ensure that the maximum run off rate of 6.5 l/s is not exceeded during a 1 in 100-year storm event, inclusive of a 20% allowance for climate change. The approximate level of storage required for the site will be traditional storage structure.
7. The proposed drainage will be designed with sufficient capacity not to flood during both 1 in 30-year storm event and 1 in 100 year plus climate change storm event (+20%) within the site. The risk of off-site flooding would not increase as a result of the development and safe access and egress will be maintained.
8. Foul flows are proposed to be taken to the public combined network operated by United Utilities.
9. The potential for pollution of controlled waters is considered to be low provided best practice procedures are following during development. Drainage systems should be maintained to ensure that they do not become blocked and unable to discharge.

References

1.	C753. The SuDS Manual. CIRIA. 2015.
2.	Manchester City Council Level 1 Strategic Flood Risk Assessment. March 2010
3.	Manchester City Council Level 2 Strategic Flood Risk Assessment. March 2011
4.	Correspondence with the United Utilities.
5.	FRA Guidance Note 1
6.	National Planning Policy Framework. March 2012.
7.	Planning Practice Guidance. http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/
8.	Technical Guidance to the National Planning Policy Framework. March 2012.
9.	Topographical Survey.
10.	Greater Manchester Surface Water Management Plan Stage 1 – A Strategic Assessment of Surface Water Flood Risk. January 2012
11.	Phase 2 Ground Investigation Report. Westlakes Environmental. April 2018



Appendix A – Architect’s Proposed Layout



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REV 15/10/17 Planning Submission
REV 08/05/17 Ground Floor above revised to Dale St
Accessed to confirm depth
Planning Submission
Project No. 22 Dale Street, Manchester
Drawing No. Proposed Ground Floor Plan
Client Falconer Commercial Property Ltd.
Drawn By Date Project No.
DAB 28/04/17 01/0019
Scale Drawing No.
1:500 (B.A.) 02-03-002_B
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Appendix B – Topographical Survey



Appendix C – Exploration Hole Location Plan

WANG, J. and T. J. GARDNER
Joint Estimation and Simulation for a Latent Markov Model

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[illegible][illegible]

NOTE: THESE FIGURES ARE BASED ON THE DATA PROVIDED BY THE NATIONAL BUREAU OF ECONOMIC RESEARCH.

FIG. 10. EFFECTS OF THE PRESENCE OF A SECONDARY CRYSTALLINE PHASE ON THE THERMAL STABILITY OF POLYMER FILMS.

100

Abstract

Reproduction is completed. At final weight, water level observed.
 Total observation considered as 1.56 before ground level = recorded abundance.

THE SECRETARY OF DEFENSE

1997-1998	1999-2000	2001-2002	2003-2004	2005-2006	2007-2008	2009-2010	2011-2012	2013-2014	2015-2016	2017-2018	2019-2020	2021-2022	2023-2024	2025-2026	2027-2028	2029-2030	2031-2032	2033-2034	2035-2036	2037-2038	2039-2040	2041-2042	2043-2044	2045-2046	2047-2048	2049-2050	2051-2052	2053-2054	2055-2056	2057-2058	2059-2060	2061-2062	2063-2064	2065-2066	2067-2068	2069-2070	2071-2072	2073-2074	2075-2076	2077-2078	2079-2080	2081-2082	2083-2084	2085-2086	2087-2088	2089-2090	2091-2092	2093-2094	2095-2096	2097-2098	2099-2100	2101-2102	2103-2104	2105-2106	2107-2108	2109-2110	2111-2112	2113-2114	2115-2116	2117-2118	2119-2120	2121-2122	2123-2124	2125-2126	2127-2128	2129-2130	2131-2132	2133-2134	2135-2136	2137-2138	2139-2140	2141-2142	2143-2144	2145-2146	2147-2148	2149-2150	2151-2152	2153-2154	2155-2156	2157-2158	2159-2160	2161-2162	2163-2164	2165-2166	2167-2168	2169-2170	2171-2172	2173-2174	2175-2176	2177-2178	2179-2180	2181-2182	2183-2184	2185-2186	2187-2188	2189-2190	2191-2192	2193-2194	2195-2196	2197-2198	2199-2200	2201-2202	2203-2204	2205-2206	2207-2208	2209-2210	2211-2212	2213-2214	2215-2216	2217-2218	2219-2220	2221-2222	2223-2224	2225-2226	2227-2228	2229-2230	2231-2232	2233-2234	2235-2236	2237-2238	2239-2240	2241-2242	2243-2244	2245-2246	2247-2248	2249-2250	2251-2252	2253-2254	2255-2256	2257-2258	2259-2260	2261-2262	2263-2264	2265-2266	2267-2268	2269-2270	2271-2272	2273-2274	2275-2276	2277-2278	2279-2280	2281-2282	2283-2284	2285-2286	2287-2288	2289-2290	2291-2292	2293-2294	2295-2296	2297-2298	2299-2300	2301-2302	2303-2304	2305-2306	2307-2308	2309-2310	2311-2312	2313-2314	2315-2316	2317-2318	2319-2320	2321-2322	2323-2324	2325-2326	2327-2328	2329-2330	2331-2332	2333-2334	2335-2336	2337-2338	2339-2340	2341-2342	2343-2344	2345-2346	2347-2348	2349-2350	2351-2352	2353-2354	2355-2356	2357-2358	2359-2360	2361-2362	2363-2364	2365-2366	2367-2368	2369-2370	2371-2372	2373-2374	2375-2376	2377-2378	2379-2380	2381-2382	2383-2384	2385-2386	2387-2388	2389-2390	2391-2392	2393-2394	2395-2396	2397-2398	2399-2400	2401-2402	2403-2404	2405-2406	2407-2408	2409-2410	2411-2412	2413-2414	2415-2416	2417-2418	2419-2420	2421-2422	2423-2424	2425-2426	2427-2428	2429-2430	2431-2432	2433-2434	2435-2436	2437-2438	2439-2440	2441-2442	2443-2444	2445-2446	2447-2448	2449-2450	2451-2452	2453-2454	2455-2456	2457-2458	2459-2460	2461-2462	2463-2464	2465-2466	2467-2468	2469-2470	2471-2472	2473-2474	2475-2476	2477-2478	2479-2480	2481-2482	2483-2484	2485-2486	2487-2488	2489-2490	2491-2492	2493-2494	2495-2496	2497-2498	2499-2500	2501-2502	2503-2504	2505-2506	2507-2508	2509-2510	2511-2512	2513-2514	2515-2516	2517-2518	2519-2520	2521-2522	2523-2524	2525-2526	2527-2528	2529-2530	2531-2532	2533-2534	2535-2536	2537-2538	2539-2540	2541-
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[illegible][illegible]

SOURCE: BUREAU OF ECONOMIC ANALYSIS, U.S. DEPARTMENT OF COMMERCE, THE DOLLAR IN INTERNATIONAL TRADE, 1964-1965. FIGURES FOR 1965 ARE PRELIMINARY.

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Keywords: *task frequency*; *competition*; *test class*; *overweight*; *water level*; *sharpened*.

**HOUSTON CITY COUNCIL
CITY ENGINEER AND SURVEYING DEPARTMENT**

JOB: HOUSTON-HIGHWAY 1010-1012-1013	DATE COMPLETED: 10/1/79
LOCATION: Houston Street	DESIGNED BY: David L. Johnson
PROJECT NO.: 1	APPROVED: [Signature]
JOB DESCRIPTION:	DATE: 1/20/1980

DATE	CITY ENGINEER	CITY SURVEYOR	CITY ENGINEER'S OFFICE	CITY ENGINEER'S OFFICE	DESCRIPTION	NO. OF STATION POINTS	STATION POINTS		NO. OF STATION POINTS	NO. OF STATION POINTS
							STATION	POINT		
10/1/79					At Houston and 1010					
					Left					
					Right					
					Left to flow from city	25	10.1			
					with stone, sand, water and bottom 100' x 100' ground	25	1.0			
						25	1.00	1.00		
					Left with to left from city and water 100' x 100' ground	25	1.0			
					Left to very small city and water 100' x 100' ground	25	1.00	1.00		
						25	1.00	1.00		
10/1/79	10/1/79	10/1/79			Left from from 100' with water 100' x 100' ground	25	1.00	1.00	25	
					Left with from city and water 100' x 100' ground	25	1.00			

STATION POINTS TO BE COMPLETED				STATION POINTS TO BE COMPLETED		
STATION	POINT	STATION	POINT	STATION	POINT	STATION

STATION POINT NO. 1010-1012-1013
 1010-1012-1013
 1010-1012-1013

NOTE: STATION POINTS TO BE COMPLETED ARE NOT TO BE COMPLETED. THE NUMBER OF STATION POINTS TO BE COMPLETED IS 1010-1012-1013.

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STATION POINTS TO BE COMPLETED IS 1010-1012-1013.

STATION POINTS TO BE COMPLETED IS 1010-1012-1013.

MANHATTAN CITY ENGINEER AND SURVEYING DEPARTMENT

JOB DESCRIPTION: Grading	DATE: 11/1/20	
LOCATION: 100th Street	PROJECT NO: 100th	DESIGNED BY: John J. [unclear]
DATE: 11/1/20	DATE: 11/1/20	DATE: 11/1/20

DATE	START TIME	BY	STATION	ELEVATION	DESCRIPTION	NO. OF POINTS	ELEVATION		NO. OF POINTS	REMARKS
							FEET	INCHES		
11/1/20				11.00	Grading surface					
				11.10	Grading					
				11.20	Grading					
				11.30	Grading, finish, etc.	1	11.30			
				11.40	Grading					
				11.50	Grading, finish, etc.	10	11.50	11.50		
				12.00	Grading, finish, etc.	10	12.00	12.00		
				12.10	Grading, finish, etc.	10	12.10	12.10		
11/1/20	11.00	By	11.00							

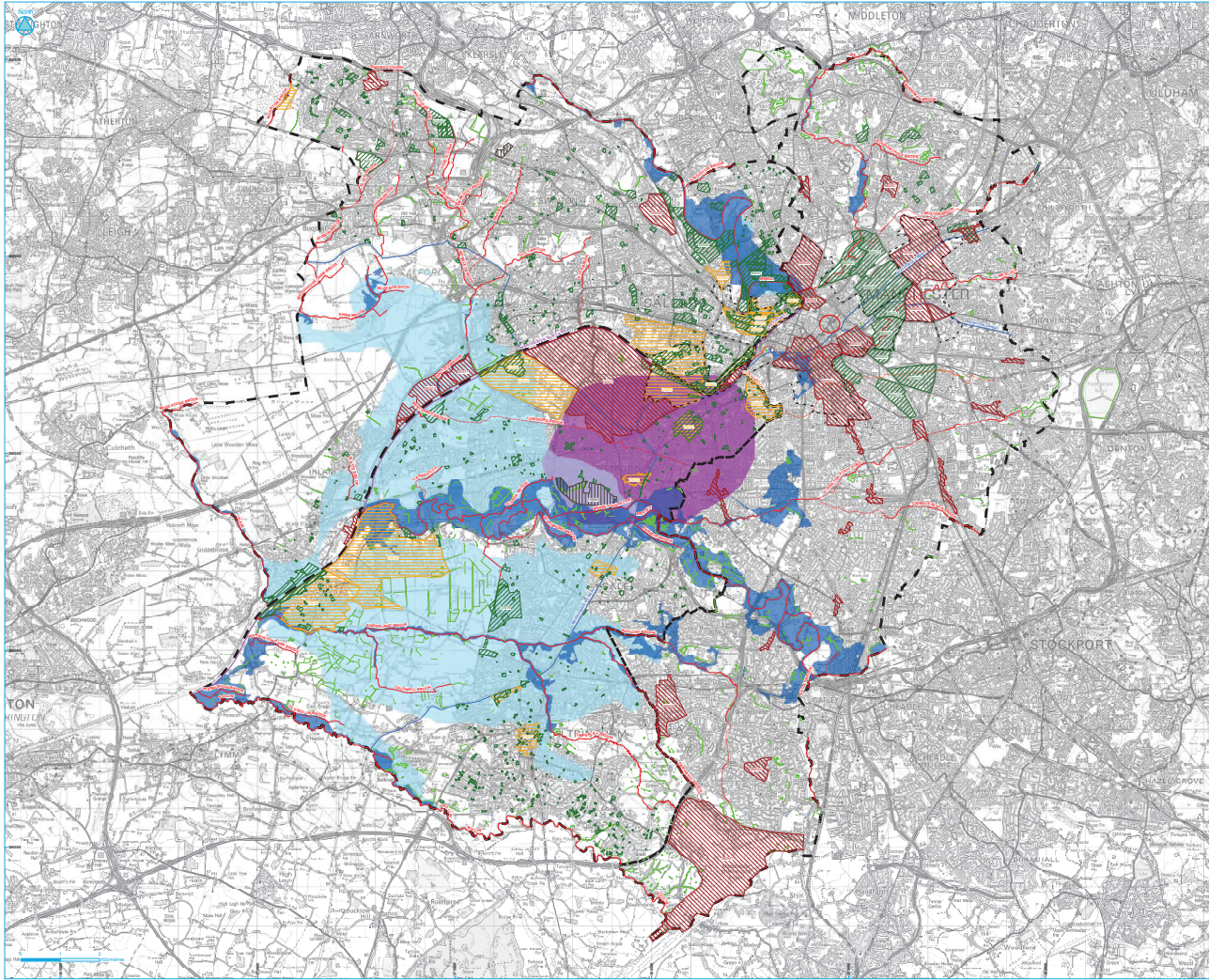
Grading, finish, etc.				Grading, finish, etc.		
DATE	TIME	BY	STATION	ELEVATION	NO. OF POINTS	REMARKS

11/1/20 11.00
 11/1/20 11.10
 11/1/20 11.20
 11/1/20 11.30
 11/1/20 11.40
 11/1/20 11.50
 11/1/20 12.00
 11/1/20 12.10

The station and elevation should be recorded throughout the work.
 Remarks: Detail per 11/1/20
 Grading finished on completion. No final elevation value level observed.
 First observation measured at 11.00 below ground level = finished elevation.



Appendix D – Flood Map for Planning



- Groundwater Issue**
 - Areas at risk of GW Flooding
 - Areas of shallow GW
 - Areas at risk of GW rebound
- Potential Development Sites / Locations**
 - Employment
 - Housing
 - Mixed Use
 - Other
- Other Waterbodies**
 - Ashdon, Bridgewater and Rochdale Canals
 - Manchester Ship Canal / Grey Inlet
 - Other Waterbodies
- Main Rivers (V8.8)**
 - Cultivated
 - Open
- Digitised River Lines**
 - Cultivated
 - Open
- Regional Centre Boundary**

The map has been produced in accordance with PF020: Development and Flood Risk and its Practice Guide. This map shows areas that are potentially at risk from groundwater flooding and should be used to inform suitable mitigation measures in a site specific Flood Risk Assessment.

The Main River information shown in the SFRA is provided by the Environment Agency. The cartographic data may deviate from that shown on base mapping due to inherent differences in data resolution. Further information on Main Rivers is provided on the Environment Agency's website. The mapping of cultivated sections of watercourses is a strategic screening only based upon Ordnance Survey 1:10,000 mapping and should be confirmed for more detailed studies such as site specific Flood Risk Assessment. The cartographic data does not necessarily cover all the canal areas, but the provided mapping is intended to provide a general overview of the main and other waterbodies in the area and is not intended to be used for a Strategic Flood Risk Assessment.

The information on the map is based on Environment Agency potential groundwater rebound areas, data from the Civil Authority, BGS and geology mapping and Delta Groundwater Emergency Maps.

The River flood between Victoria Station and Piccadilly Station is not shown as a Main River on the Environment Agency's Flood Map although Flood Zones related to the river are. The same agreement has been taken in this SFRA.



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for
Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA
Groundwater Flooding

Client: JBA	Ref: 00000011	The map has been produced in accordance with PF020: Development and Flood Risk and its Practice Guide. This map shows areas that are potentially at risk from groundwater flooding and should be used to inform suitable mitigation measures in a site specific Flood Risk Assessment.
Client: JBA	Ref: 00000011	The map has been produced in accordance with PF020: Development and Flood Risk and its Practice Guide. This map shows areas that are potentially at risk from groundwater flooding and should be used to inform suitable mitigation measures in a site specific Flood Risk Assessment.
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Client: JBA	Ref: 00000011	The map has been produced in accordance with PF020: Development and Flood Risk and its Practice Guide. This map shows areas that are potentially at risk from groundwater flooding and should be used to inform suitable mitigation measures in a site specific Flood Risk Assessment.



Appendix E – United Utilities Records/Correspondance

WestLakes Engineering Ltd
Unit 2.1
20 Dale Street

Manchester
M1 1EZ

FAO: Catherine Hamblett

United Utilities Water Limited
Property Searches
Ground Floor Grasmere House
Lingley Mere Business Park
Great Sankey
Warrington
WA5 3LP
DX 715568 Warrington
Telephone 0370 751 0101

Property.searches@uuplc.co.uk

Your Ref: CAH07042917
Our Ref: 1283586
Date: 11/4/2017

Dear Sirs

Location: 27 DALE STREET MANCHESTER M1 1EY

I acknowledge with thanks your request dated 07/04/17 for information on the location of our services.

Please find enclosed plans showing the approximate position of our apparatus known to be in the vicinity of this site.

The enclosed plans are being provided to you subject to the United Utilities terms and conditions for both the wastewater and water distribution plans which are shown attached.

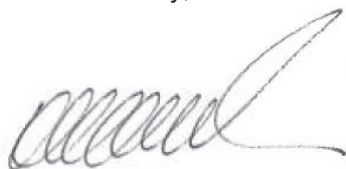
If you are planning works anywhere in the North West, please read our access statement before you start work to check how it will affect our network.

<http://www.unitedutilities.com/work-near-asset.aspx>.

I trust the above meets with your requirements and look forward to hearing from you should you need anything further.

If you have any queries regarding this matter please telephone us on 0370 7510101.

Yours Faithfully,



Karen McCormack
Property Searches Manager

TERMS AND CONDITIONS - WASTERWATER & WATER DISTRIBUTION PLANS

These provisions apply to the public sewerage, water distribution and telemetry systems (including sewers which are the subject of an agreement under Section 104 of the Water Industry Act 1991 and mains installed in accordance with the agreement for the self-construction of water mains) (UUWL apparatus) of United Utilities Water Limited "(UUWL)".

TERMS AND CONDITIONS:

1. This Map and any information supplied with it is issued subject to the provisions contained below, to the exclusion of all others and no party relies upon any representation, warranty, collateral contract or other assurance of any person (whether party to this agreement or not) that is not set out in this agreement or the documents referred to in it.
2. This Map and any information supplied with it is provided for general guidance only and no representation, undertaking or warranty as to its accuracy, completeness or being up to date is given or implied.
3. In particular, the position and depth of any UUWL apparatus shown on the Map are approximate only and given in accordance with the best information available. The nature of the relevant system and/or its actual position may be different from that shown on the plan and UUWL is not liable for any damage caused by incorrect information provided save as stated in section 199 of the Water Industry Act 1991. UUWL strongly recommends that a comprehensive survey is undertaken in addition to reviewing this Map to determine and ensure the precise location of any UUWL apparatus. The exact location, positions and depths should be obtained by excavation trial holes.
4. The location and position of private drains, private sewers and service pipes to properties are not normally shown on this Map but their presence must be anticipated and accounted for and you are strongly advised to carry out your own further enquiries and investigations in order to locate the same.
5. The position and depth of UUWL apparatus is subject to change and therefore this Map is issued subject to any removal or change in location of the same. The onus is entirely upon you to confirm whether any changes to the Map have been made subsequent to issue and prior to any works being carried out.
6. This Map and any information shown on it or provided with it must not be relied upon in the event of any development, construction or other works (including but not limited to any excavations) in the vicinity of UUWL apparatus or for the purpose of determining the suitability of a point of connection to the sewerage or other distribution systems.
7. No person or legal entity, including any company shall be relieved from any liability howsoever and whensoever arising for any damage caused to UUWL apparatus by reason of the actual position and/or depths of UUWL apparatus being different from those shown on the Map and any information supplied with it.
8. If any provision contained herein is or becomes legally invalid or unenforceable, it will be taken to be severed from the remaining provisions which shall be unaffected and continue in full force and affect.
9. This agreement shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts, save that nothing will prevent UUWL from bringing proceedings in any other competent jurisdiction, whether concurrently or otherwise.

Wastewater Symbolology

Combined Foul Surface Overflow

				Manhole
				Manhole, side entry
				Public sewer
				Private sewer
				S104 sewer
				Rising main, public
				Rising main, private
				Rising main, S104
				Highway drain, private
				Screen chamber
				Discharge point
				Outfall
				Control kiosk
				Sludge main

Abandoned pipe

	Public sewer
	Rising main
	Private sewer
	Sludge main

Manhole function

FO	Foul
SW	Surface Water
CO	Combined
OV	Overflow

Sewer shape

CI	Circular	SQ	Unspecified
EG	Egg	TR	Square
OV	Oval	AR	Trapezoidal
FT	Flat top	BA	Arch
RE	Rectangular	HO	Barrel
			Horse shoe

Sewer material

AC	Asbestos cement	DI	Ductile iron
BR	Brick	VC	Vitrified clay
CO	Concrete	PP	Polypropylene
CSB	Concrete segment	PF	Pitched fibre
CSU	Concrete segment	MA	Masonry, coursed
CC	Concrete box culverted	MA	Masonry, random
PSC	Plastic	RP	Reinforced plastic
GR	Glass reinforced	CI	Cast iron
GRP	Glass reinforced	SI	Spun iron
PVC	Polyvinyl chloride	ST	Steel
PE	Polyethylene	U	Unspecified

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			Rodding eye
			Lamp hole
			T junction/sadc
			Gully
			Air valve
			Non return valv
			Sewer overflow
			Cascade
			Flow meter
			Hatch box
			Hydrobrake
			Inlet
			Bifurcation
			Catchpit
			Oil interceptor
			Penstock
			Summit
			Valve
			Valve chamber
			Washout cham
			Drop shaft
			WW treatment
			Septic tank
			Vent column
			Network storag
			Orifice plate
			Vortex chambe
			Penstock chan

From: Gemma McCaig
Sent: 09 August 2018 17:04
To: Joel Cunliffe <Joel.Cunliffe@westlakes.co.uk>
Subject: FW: PDE UU Ref: 4200021122 27 Dale Street Manchester

Hi Joel

See below for confirmation from United Utilities that we do not need to enter a Build Over Agreement for any of the sewers around 27 Dale Street.

I will speak to Manchester Council about the associated costs of temporary road and lane closures which will be required for a drainage survey to be undertaken. I'll pull together a total cost for the proposed works so we can forward it to the Client for approval.

Thanks

Gemma McCaig BEng (Hons) EngTech MICE
Civil Engineer

Tel: 0161 236 8203
Web: www.westlakes.co.uk

Unit 2.1, 20 Dale Street, Manchester, M1 1EZ



The Manchester Office are proud to be supporting East Lancashire Hospice as our nominated charity of the year. East Lancashire Hospice consists of many different services which are available to people with life-limiting illnesses. Please see their website for more information <https://eastlancshospice.org.uk/>

From: Harrison, William <William.Harrison1@uuplc.co.uk>
Sent: 09 August 2018 16:45
To: Gemma McCaig <Gemma.McCaig@westlakeengineering.onmicrosoft.com>
Cc: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Subject: PDE UU Ref: 4200021122 27 Dale Street Manchester

Good Afternoon Gemma,

I would advise that a Building Over Agreement wouldn't be required as the retaining walls are already in situ and any foundations from your proposals are to be piled within the retaining wall and to a depth below the invert of the

sewer. I only recommend pre and post CCTV for peace of mind that the construction works haven't caused any detriment to our asset,

I hope this helps,

Kind Regards,

Will Harrison BSc (Hons)

Assistant Developer Engineer
Developer Services & Planning
Network Delivery
United Utilities

T : 01925 679319

E : Wastewaterdeveloperservices@uuplc.co.uk

If you have received a great service today why not tell us?

Visit: unitedutilities.com/wow

**United Utilities Water Ltd. - Developer Services and Planning
Warrington North Wastewater Treatment Works
Barnard Street Off Old Liverpool Road
Gatewarth Industrial Estate
Warrington
WA5 1DS**

From: Gemma McCaig [<mailto:Gemma.McCaig@westlakeengineering.onmicrosoft.com>]

Sent: 07 August 2018 15:25

To: Harrison, William <William.Harrison1@uuplc.co.uk>

Cc: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>

Subject: RE: PDE UU Ref: 4200021122 27 Dale Street Manchester

Hi Will

Thanks for your response.

I will arrange a CCTV survey to be undertaken prior to construction and pass these on to you.

Can you confirm whether we will need to enter into an agreement or whether this depends on the condition of the sewer.

Kind regards

Gemma McCaig BEng (Hons) EngTech MICE
Civil Engineer

Tel: 0161 236 8203

Web: www.westlakes.co.uk

Unit 2.1, 20 Dale Street, Manchester, M1 1EZ



The Manchester Office are proud to be supporting East Lancashire Hospice as our nominated charity of the year. East Lancashire Hospice consists of many different services which are available to people with life-limiting illnesses. Please see their website for more information <https://eastlancshospice.org.uk/>

From: Harrison, William <William.Harrison1@uuplc.co.uk>
Sent: 07 August 2018 11:40
To: Gemma McCaig <Gemma.McCaig@westlakeengineering.onmicrosoft.com>
Cc: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Subject: PDE UU Ref: 4200021122 27 Dale Street Manchester

Good Afternoon Gemma,

Many thanks for the additional drawing,

In principle I would have no objections to these proposals, however I would suggest pre and post construction CCTV surveys of the sewers in order to determine their condition,

Kind Regards,

Will Harrison BSc (Hons)
Assistant Developer Engineer
Developer Services & Planning
Network Delivery
United Utilities

T : 01925 679319
E : Wastewaterdeveloperservices@uuplc.co.uk

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United Utilities Water Ltd. - Developer Services and Planning
Warrington North Wastewater Treatment Works
Barnard Street Off Old Liverpool Road
Gatewarth Industrial Estate
Warrington
WA5 1DS

From: Gemma McCaig [<mailto:Gemma.McCaig@westlakeengineering.onmicrosoft.com>]
Sent: 01 August 2018 12:15
To: Harrison, William <William.Harrison1@uuplc.co.uk>
Cc: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Subject: RE: PDE UU Ref: 4200021122 27 Dale Street Manchester

Hi Will

Further to our discussion back in June, please see attached PDF for the proposed building arrangement and section through the foundations relative to the sewers in the surrounding streets.
The sections show the existing buried retaining wall will not be altered. The piles will be set back from this retaining wall and will transfer the loading of the structure directly into the ground.

Please let me know your thoughts on this and whether you believe it is still necessary to enter into a build over agreement.

Kind regards

Gemma McCaig BEng (Hons) EngTech MICE
Civil Engineer

Tel: 0161 236 8203

Web: www.westlakes.co.uk

Unit 2.1, 20 Dale Street, Manchester, M1 1EZ



The Manchester Office are proud to be supporting East Lancashire Hospice as our nominated charity of the year. East Lancashire Hospice consists of many different services which are available to people with life-limiting illnesses. Please see their website for more information <https://eastlancshospice.org.uk/>

From: Harrison, William <William.Harrison1@uuplc.co.uk>

Sent: 07 June 2018 13:09

To: Gemma McCaig <Gemma.McCaig@westlakeengineering.onmicrosoft.com>

Cc: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>

Subject: PDE UU Ref: 4200021122 27 Dale Street Manchester

Good Afternoon Gemma,

We have carried out an assessment of your application which is based on the information provided; this pre development advice will be valid for 12 months,

Foul water can be discharged to the public combined water sewerage network at an unrestricted rate and can be connected at a point convenient to yourself,

Surface water from this site must drain to soak away or some other form of infiltration system but if ground conditions confirm that this is not a viable solution then the surface water can be discharged to the existing public combined water sewerage network with a maximum pass forward flow rate of 6.5l/s.

Although we may discuss and agree discharge points & rates in principle, please be aware that you will have to apply for a formal sewer connection. This is so that we can assess the method of construction, Health & Safety requirements and to ultimately inspect the connection when it is made. Details of the application process and the form itself can be obtained from our website by following the link below

<http://www.unitedutilities.com/connecting-public-sewer.aspx>

I note your Building Over Application also, in order to progress this we will need a CCTV survey of the sewer showing it's condition and exact location – any sewer in poor repair will not be allowed to be built over. And as you have

alluded to below, we will need drawings and/or calcs demonstrating that no additional loading is going to be applied to the sewer.

One further point to note is that Building Regs states that manholes cannot be built over due to the reduced access this will give to the undertaker.

Please be aware that on site drainage must be designed in accordance with Building Regulations, National Planning Policy, and local flood authority guidelines, we would recommend that you speak and make suitable agreements with the relevant statutory bodies.

Please note, if you intend to put forward your wastewater assets for adoption by United Utilities, the proposed detail design will be subject to a technical appraisal by an Adoption Engineer as we need to be sure that the proposals meets the requirements of Sewers for adoption and United Utilities Asset Standards. The proposed design should give consideration to long term operability and give United Utilities a cost effective proposal for the life of the assets. Therefore, further to this enquiry should you wish to progress a Section 104 agreement, we strongly recommend that no construction commences until the detailed drainage design, submitted as part of the Section 104 agreement, has been assessed and accepted in writing by United Utilities. Any works carried out prior to the technical assessment being approved is done entirely at the developers own risk and could be subject to change.

Kind Regards,

Will Harrison BSc (Hons)

Assistant Developer Engineer
Developer Services & Planning
Operational Services
United Utilities

T : 01925 679319

E : Wastewaterdeveloperservices@uuplc.co.uk

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Barnard Street Off Old Liverpool Road
Gatewarth Industrial Estate
Warrington
WA5 1DS**

From: Gemma McCaig [<mailto:Gemma.McCaig@westlakeengineering.onmicrosoft.com>]

Sent: 23 May 2018 11:28

To: DeveloperServicesWater <DeveloperServicesWater@uuplc.co.uk>

Subject: Predevelopment enquiry - 27 Dale Street Manchester

Hi

I am currently looking at a proposed development in the centre of Manchester and require some advice regarding an objection letter from United Utilities received during the planning application. The letter refers to the close proximity of the existing combined sewers around the site and the potential for multiple build over agreements.

I can confirm that piles will be used for the building foundations and as a result there should not be any transfer of loads on to the sewers surrounding the site.

I have attached copy of the completed predevelopment enquiry along with a site location plan and a drawing of the proposed drainage strategy. I have also attached a copy of the objection letter for your information.

Any advice you can provide would be greatly appreciated.

Kind regards

Gemma McCaig BEng (Hons) EngTech MICE
Civil Engineer

Tel: 0161 236 8203

Web: www.westlakes.co.uk

Unit 2.1, 20 Dale Street, Manchester, M1 1EZ



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EMGateway3.uuplc.co.uk made the following annotations

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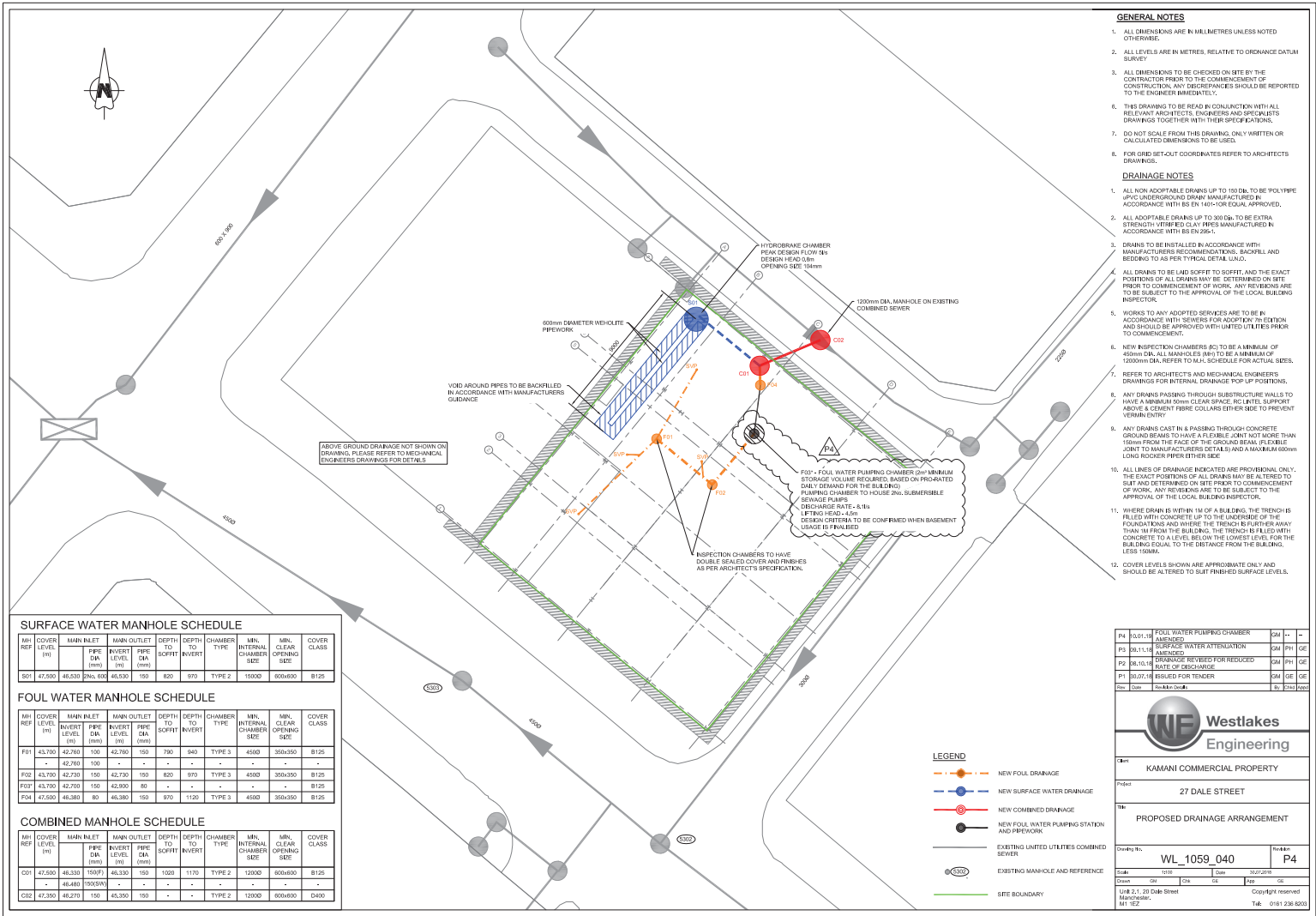
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Appendix F – Drainage Strategy Drawings

Do not scale this drawing





Appendix G – Microdrainage Modelling Calculations

